

REMARKS

Independent Claims 1 and 18 have been amended to address the informalities noted by the Examiner.

Independent Claim 1 defines the invention as a multi-layered molding material including a layer of a fibrous reinforcement material and a layer of a reinforcement resin material conjoined with the layer of fibrous reinforcement material. The layer of reinforcement resin material has an inherent tack that holds the fibrous reinforcement material in place. The reinforcement material is at least partially dry with respect to the reinforcement resin. The reinforcement resin material includes a venting structure having venting channels for conducting gases in directions both parallel to the plane of the reinforcement layer and perpendicular thereto. This allows gases to pass out of the molding material via the reinforcement layer during processing to prevent entrapment of gases. Similarly, independent Claim 18 defines the invention as a multi-layered molding material including a layer of a fibrous reinforcement material and a layer of a resin material conjoined with the layer of fibrous reinforcement material. The resin material includes a venting structure to allow gases to pass out of said molding material via the reinforcement layer during processing.

The Examiner rejected Claims 18-20 and 23-25 as being anticipated by the Ness et al. reference, which is owned by the assignee of this application. These rejections are respectfully traversed. The claimed multi-layered molding material was developed to overcome the problems associated with known materials, such as those disclosed in the Ness et al. reference. In the Ness et al. materials, the channels for removal of air are located in fibrous reinforcement layers and in the interface between each ply of reinforcement. In such unidirectional materials, the fibers in each ply move closer together on application of a vacuum. As a result, there are limited air paths in the planar direction of the fiber and fewer in the perpendicular direction. This problem becomes more acute if the materials are made from fibers having a small diameter, e.g. carbon fibers (7 μ m fiber).

In contrast, the claimed molding material includes these planar air channels and has additional in-plane air channels within the resin layer. This results in an additional

air permeability within this layer. In the embodiment shown in Figure 2 of the specification, the channel in the resin film also traverses connecting fibers that are adjacent to each other, resulting in improved air movement transverse to the fiber. This overcomes blockages that can form in the fiber length caused by wet-out areas. Significantly, the additional air channels in the claimed material provide through thickness air connection between the layers of reinforcement. This has the benefits of higher permeability of the plies or dry fiber layers within the laminate stack. This advantage is particularly seen in a stack having a sequence of many plies. The through-thickness gaps allow for the effective removal of air from the stack, irrespective of the number of plies used. In contrast, the continuous resin film in the Ness et al. material does not allow for this through thickness connection, and air has to travel along the length of the material to the vacuum source. Accordingly, the claimed molding material provides for faster and more reliable air removal than the material disclosed in the Ness et al. reference. This advantage is particularly noticeable on physically larger components. Thus, the invention as defined in Claims 18-20 and 23-25 is clearly not anticipated by the Ness et al. reference.

The Examiner rejected Claims 1-8, 21, and 22 as being obvious in view of the combined teachings of the Ness et al. and Rolston references. These rejections are also respectfully traversed.

The Rolston reference relates to vacuum assisted resin transfer molding or vacuum assisted resin injection molding. A person having ordinary skill in the art would not consider this process to be the same as venting a prepreg material. In the process disclosed in the Rolston reference, dry reinforcements are placed into a mold, and a vacuum is applied to remove trapped air. Liquid resin is then injected, usually at raised pressure. In Figure 2 of the Rolston reference, cylindrical tubes are packed into the center of the material so that channels are created that assist the flow of the resin along the length of the material during processing. It should be noted that injecting resin into a fiber stack has its own associated problems. As the resin moves away from the injection point, there is a drop in flow rate which results in uneven delivery of resin through the material. This is a particular problem in larger materials. In

addition, in the material of the Rolston reference, the tubes are sealed and hollow, and the fiber mat remains on the outer surface, resulting in a material that has a core structure and is not as adaptable to producing multi-ply laminates as the claimed material.

The material disclosed in Figures 3 and 4 of the Rolston reference is mainly used to produce a flat, planar structure. For example, in Column 4, Line 54, it is disclosed that the structure of Figures 3 and 4 of the Rolston reference is suitable for use as a tabletop. The material 52 is not a resin material, but a low density filler material having longitudinal grooves that provide channels to assist resin flow following injection. In the preferred embodiment, the material is closed-cell plastic foam, which has grooves formed along its length that act as flow channels. At Column 4, Lines 44-49 of the Rolston reference, other suitable packing materials, such as granules, plastic and glass spheres, are defined.

A person having ordinary skill in the art would consider the material of the Rolston reference to be a "core" or "sandwich panel material" rather than a reinforcement material. The grooves in the material are provided to assist resin flow rather than air removal. In addition, the grooves run through the length of the material, but not through the thickness of the material. In contrast, in the claimed material, substantial venting is achieved through the thickness of the material. The central ventilated structure is a resin material for subsequent impregnation of the fiber sheets. Thus, the invention as defined in Claims 1-8, 21, and 22 is clearly not obvious in view of the combined teachings of the Ness et al. and Rolston references.

Respectfully submitted,



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